

REMARKS

Claims 1-15 are pending. Support for the changes to the claims and for the new claims may be found in the specification as originally filed, for example:

Claim 1	Page 6, lines 4 and 8, Figures 1 and 2 and page 5, lines 25-28;
Claim 3	page 5, lines 26-29 and Figure 1;
Claim 4	page 5, lines 20-21 and Figure 1;
Claim 5	page 3, lines 12-14;
Claim 6	page 3, last paragraph;
Claim 7	page 3, last paragraph;
Claim 8	page 4, lines 1-7 and page 5, lines 26-28;
Claim 9	page 4, lines 14-16;
Claim 10 and 11	paragraph bridging pages 4-5 and page 5, lines 25-28;
Claim 12	page 5, lines 12-14;
Claim 13	page 5, line 14;
Claim 14	page 5, lines 14-17; and
Claim 15	page 8, lines 17-19.

I. The Rejection Based on Geer et al. (US Patent 6,440,332)

Claim 1-3 rejected under 35 U.S.C. §102(a) as allegedly being anticipated by Geer et al (US Patent 6,440,332).

The Examiner states that, for purposes of examination, claim 1 will be construed only to require an electro conductive polymer comprising a metal filled in between the chains of the polymer. The Examiner states that the remaining limitations of the claim will be construed as product by process limitations.

The Examiner alleges that Geer teaches a method for producing a coating system that provides corrosion protection for metal substrates (Abstract). The Examiner notes that the coating may contain a resin base and inherently conductive polymers, and metal particles and may be a waterborne coating composition. The Examiner also notes Example V, column 11, lines 55-67 of Geer.

The Examiner concludes that the prior art would inherently contain a cation species since the conductive polymer is dispersed in aqueous solution and free hydrogen ions present in the polymer would associate with negatively charged functional groups of the ICP.

Applicants respectfully submit that the present invention is not anticipated by or obvious over the disclosures of Geer et al and request that the Examiner reconsider and withdraw this rejection in view of the following remarks.

The present invention is "A new organic/inorganic composite material created when a galvanic corrosion reaction is induced between polymer and metal, based on the data of difference in work function, which then, with electroconductive polymer and metal oxide, self-

assemble in a nano-space.” Applicants respectfully submit that the involvement of a galvanic corrosion reaction results in a product that is not the same as or obvious from a product not produced by such a reaction. That is, the products are material different.

For galvanic corrosion reaction to occur, one requirement is the presence of a large difference in work function between electroconductive polymer and metal. A second requirement for galvanic corrosion reaction to occur is for the electroconductive polymer to be oxidized, specifically, a condition where cation radical and dication, as mentioned in Claim 1 of this invention, are present.

Applicants respectfully submit that the materials of the present material claims and those of Geer et al are patentably distinct.

As to claim 3, the Examiner’s comments concerning “product by process” claims do not apply to method claim 3.

For the above reasons, it is respectfully submitted that the subject matter of claims 1-3 is neither taught by nor made obvious from the disclosures of Geer et al and it is requested that the rejection under 35 U.S.C. §102 be reconsidered and withdrawn.

II. The Rejection Based on Muramatsu et al. (US Patent 4477485)

Claim 4 is rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Muramatsu et al. (US Patent 4477485).

The Examiner states that Muramatsu et al teaches a method for forming an electrode of an organic cell by forming a thin film of a metal over a sheet of an organic electro conductive material and that the metals disclosed include aluminum, tin or nickel (Column 1, lines 5965).

Organic materials include polyacetylene, polyparaphenylene or polypyrrole (Column 1, line 60). The Examiner also states that the method of Muramatsu et al includes a further step of using a recoil ion implantation method to create an interdiffusion layer between the organic material and the metal to provide better adhesion between the layers (Column 1, lines 47-51).

The Examiner notes that Muramatsu et al does not teach the presence of water.

The Examiner concludes that it would have been obvious to one of ordinary skill in the art that any organic electro conductive material made from the conductive polymers disclosed above could absorb moisture from the atmosphere prior to the deposition of the metal coating due to the highly polar nature of conductive polymers and films made therefrom.

Applicants respectfully submit that the present invention is not anticipated by or obvious over the disclosures of Muramatsu et al and request that the Examiner reconsider and withdraw this rejection in view of the following remarks.

Again, for galvanic corrosion reaction to occur, a requirement is the presence of a large difference in work function between electroconductive polymer and metal. Regarding electroconductive polymer and metal element of Muramatsu et al, the work function of the electroconductive polymer (polyacetylene, polyparaphenylene, polypyrrole) is about 5eV, and the metal that reacts with this, of the metals mentioned in the specification, are Al (4.3 eV) and Tin (4.4 eV). Similarly, with other metals mentioned in the specification, Nickel (5.2 eV) and Silver (4.6-4.7 eV), galvanic corrosion reaction would not occur.

Again, a second requirement for galvanic corrosion reaction to occur is for the electroconductive polymer to be oxidized, specifically, a condition where cation radical and dication, as mentioned in Claim 1 of this invention, are present. Muramatsu et al's patent is simply an electroconductive polymer, and there is no statement made as to whether it is oxidized. It is likely in a non-oxidized state, an electrically neutral state (where cation radical and dication do not exist). In such a state, no matter what type of metal is brought into its contact, galvanic corrosion reaction will not occur.

Moreover, another difference is that, in Muramatsu et al's patent, there are too much metal vapor-deposited in comparison to the amount of electroconductive polymer. In the present invention, for example, when polypyrrole film is used as electroconductive polymer, as shown in Embodiment 1, the thickness of the aluminum film that is brought into contact of film thickness of about 400nm is about 20nm. If any thicker aluminum is vapor-deposited, aluminum that would not be able to react would remain on top of the polypyrrole film. Therefore, when too much aluminum is vapor-deposited, the result would simply be aluminum film remaining on top of polypyrrole film, and absorbed water cannot penetrate within polypyrrole through micro-void, micro-scratch or pinhole, and galvanic corrosion reaction would not occur. Muramatsu et al's patent vapor-deposited 10KÅ (therefore, 1000 nm) of thick aluminum film on top of polyacetylene film, so aluminum, which is close to polyacetylene film, would likely have difficulty reacting even if there is moisture within atmosphere, and it is expected that most of it would remain as aluminum.

Amendment Under 37 C.F.R. §1.111
Application No. 10/526,147
Attorney Docket No. 052095

For the above reasons, it is respectfully submitted that the subject matter of claim 4 is neither taught by nor made obvious from the disclosures of Muramatsu et al and it is requested that the rejection under 35 U.S.C. §103(a) be reconsidered and withdrawn.

III. Correction to Applicants' Specification

The specification, page 5, lines 25-28 is amended to correct an error in the translation of the PCT application. Since the present application is a National Stage of the PCT application, the present application is required to be a copy of the PCT and the correction is necessary. See the attached page 6 from the PCT application.

Additionally, the specification has been amended to replace the headings with the USPTO recommended headings. See MPEP 608.01.

IV. Conclusion

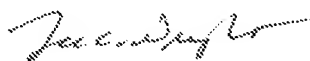
In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

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If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
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そして、第1図の下の部分に拡大して示すように、金属1を付着させた導電性ポリマー3を吸着水2が存在する状態に保持することにより、金属1のマイクロボイド、マイクロストラッチ、ピンホール4などから吸着水2が導電性ポリマー3内に浸透するようにすると、金属1-カチオンラジカル及びジカチオン9-吸着水2の三者の間で化学反応が起こり、酸化され易い金属1が導電性ポリマー3内に侵入しつつ酸化（一部水酸化物化）されることとなる。

一方、導電性ポリマー3は還元反応を受け、ポリマー内のカチオンラジカル及びジカチオン9が消滅し、ドーパント8が脱ドーブされる。生じた金属酸化物/水酸化物7は導電性ポリマー3内に侵入し、拡散により移動してポリマー鎖10間のナノ空間に存在することになる。

以上の結果は、金属-ラジカルカチオン及びジカチオン-吸着水の三者の間でガルバニ電池が形成され、仕事関数のより小さな酸化され易い金属から、仕事関数のより大きなポリピロールフィルムに電子移動が生じたことに起因する。この電子移動により酸化されやすい金属は吸着水の存在下でガルバニ腐食反応により酸化され、その酸化物（アルミニウムの場合は Al_2O_3 /水酸化物（ $Al_2O_3 \cdot xH_2O$ ）に変化する。）

第2図に、このようなガルバニ腐食反応の結果によって改質された導電性ポリマー材料の模式図を示す。第2図に示すように、ポリマー鎖10間に金属-カチオンラジカル及びジカチオン-吸着水の三者の間の化学反応により形成されたアルミニウム酸化物/水酸化物7が含まれた導電性ポリマーが得られる。金属の蒸着量が不足する場合には、脱ドーブ後にドーパント8や未反応のカチオンラジカル及びジカチオン9が残存するが、残存の程度は金属の蒸着量により調整でき